Growing WILD

Spring/Summer 2001

Utah's Project WILD Newsletter

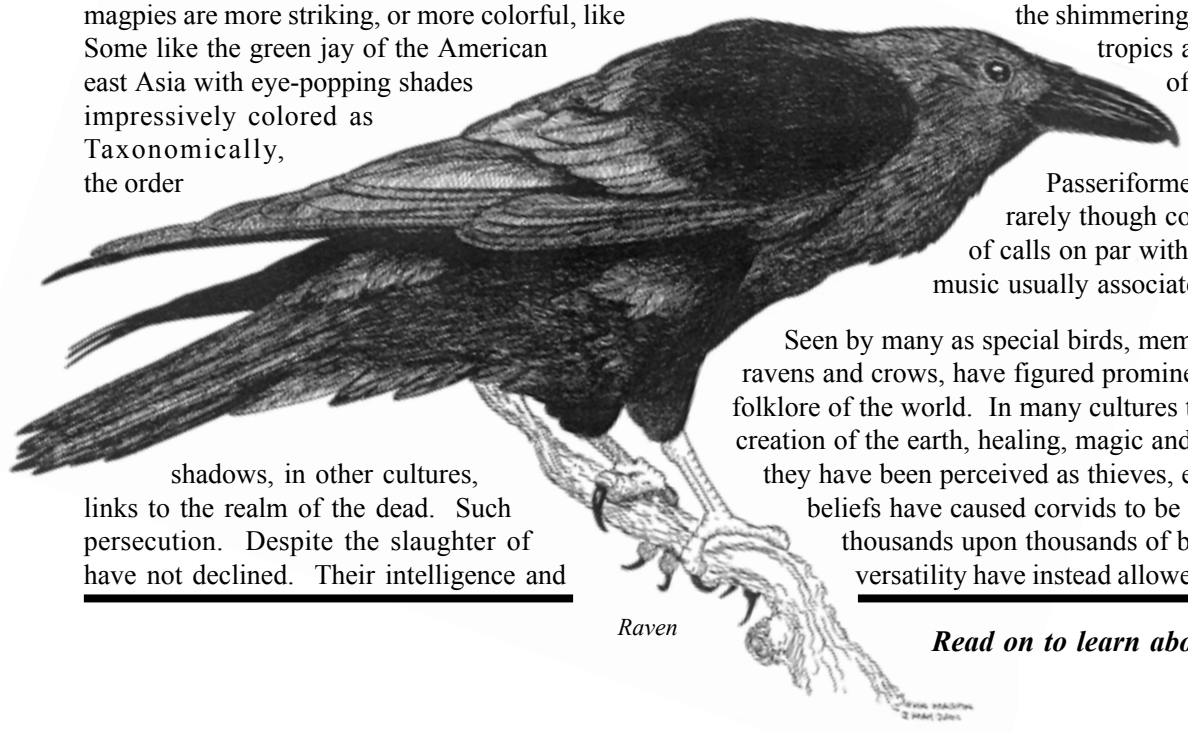
Utah's Clever Crows and Company

"If men had wings and bore black feathers, few of them would be clever enough to be crows." There is much truth to this quote made by Reverend Henry Ward Beecher in the mid-1800s. Words such as "intelligent" and "resourceful" have often been used aptly to describe members of the crow family, the Corvidae: crows, ravens, magpies and jays. Indeed, corvids rank among the most intelligent of birds and are considered at the top of the line in avian evolution. As written by Candace Savage in her book, *Bird Brains*, "As a group, corvids are commonly said to be uncommonly smart."

Many fables and stories reflecting the incredible intelligence of corvids have been shared throughout time. One of Aesop's fables tells how a thirsty crow ingeniously raised the level of water in a narrow-necked, clay pitcher to within reach of its bill by dropping one pebble after another into the pitcher to displace the water at the bottom. Another well-known story tells of a crow that learned to pull up a fishing line from a hole and eat the bait by pulling on the line with its beak and stepping on the line to keep it from slipping back into the hole. Experiments with captive crows have shown they can learn to count, make use of tools, solve puzzles and perform amazing feats of memory. Many also know how some corvids can readily mimic sounds of other birds and animals and even the spoken words of people.

Although numerous authenticated stories attest to the superior intelligence and adaptability of corvids, measuring true intelligence is quite challenging and few scientific studies have actually been done. Based on the published research of animal cognition that has been done, scientists surmise that corvids are among a few species of birds (as are parrots and mynas) which may share the cognitive capacity of many primates. In the brains of birds, a highly developed portion of the forebrain, called the hyperstriatum, serves as the chief organ of intelligence. (The equivalent in mammals is the cerebral cortex.) The larger the hyperstriatum the better the bird fares on tests of intelligence. Crows, ravens and magpies measure high on both scales, and corvids in general, are at the top among birds for overall brain size, with brain-to-body ratios equal to that of dolphins and nearly matching that of humans. Their large brains are also packed tight with an exceptionally large number of brain cells.

Exceptional intelligence, reflected in adaptability, has allowed corvids to diversify and occupy nearly every part of the globe. Worldwide, 103 species compose the family. Forty of these species are considered the true crows in the genus Corvus which includes crows, jackdaws, rooks and ravens. Most people are familiar with this crow-like tribe of large, raucous, dark-feathered birds with short- to medium-length tails and powerful bills. The other 63 species in the family include magpies, jays, nutcrackers and choughs. All are also stocky birds with strong bills and harsh voices, but many, such as the flashy black and white patterned magpies are more striking, or more colorful, like the shimmering metallic blue-feathered jays. Some like the green jay of the American tropics and the green magpie of South-east Asia with eye-popping shades of emerald, yellow and red are as impressively colored as the showiest of parrots. Taxonomically, corvids are classified within the order Passeriformes, the songbirds. One would rarely though consider their raucous repertoire of calls on par with the more melodious of nature's music usually associated with songbirds.

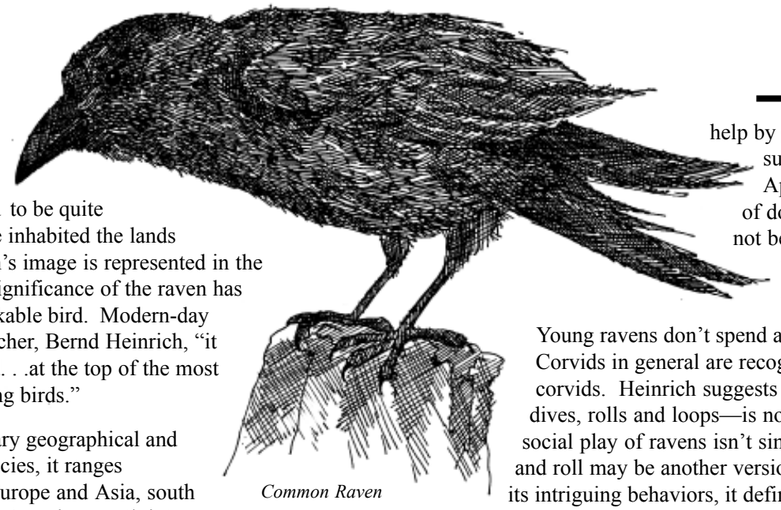


Raven

Seen by many as special birds, members of the Corvidae, especially ravens and crows, have figured prominently in the mythology and folklore of the world. In many cultures they have been linked to creation of the earth, healing, magic and successful hunting. Black as shadows, in other cultures, they have been perceived as thieves, evil portents of misfortune and links to the realm of the dead. Such beliefs have caused corvids to be subjected to considerable persecution. Despite the slaughter of thousands upon thousands of birds, corvid populations overall have not declined. Their intelligence and versatility have instead allowed them to thrive especially well.

Read on to learn about Utah's Clever Corvids!

The Corvid Clan



Common Raven

Common Raven: *Corvus corax*

The Common Raven is "common" only in the sense that it is the species of raven most commonly known to people. In many other respects it is commonly considered to be quite uncommon. The raven has probably aligned with humans for as long as humans have inhabited the lands of the north. Undoubtedly the raven escorted our forebearers upon the hunt. A raven's image is represented in the Death of the Birdman scene at Lascaux. Throughout time, the spiritual and cultural significance of the raven has been well elucidated in the innumerable legends, stories and writings about this remarkable bird. Modern-day science has shown the raven to be quite special as well. In the words of raven researcher, Bernd Heinrich, "it is probably only a slight exaggeration to say the raven, *C. corax* is the ultimate corvid. . .at the top of the most species-rich and rapidly evolving line of birds. . .the *ne plus ultra* of the up and coming birds."

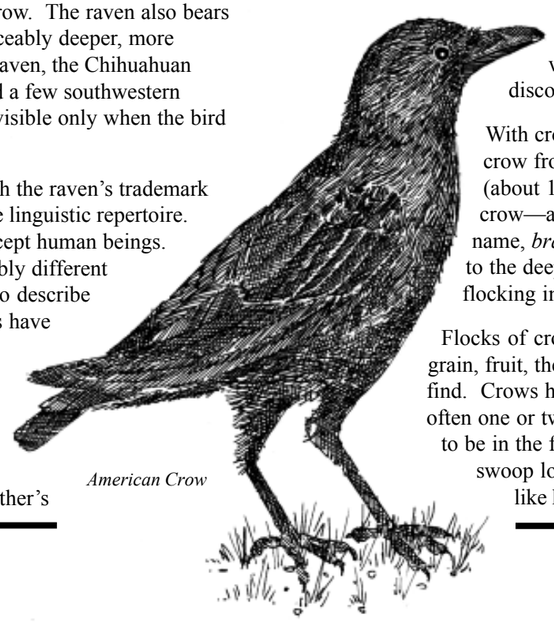
The Common Raven is likely so familiar due to the fact that it occupies an extraordinary geographical and ecological range. No other bird in the world has a wider distribution. A holarctic species, it ranges throughout the northern hemisphere from above the Arctic Circle, through much of Europe and Asia, south into northern Africa, and over most of Canada and the western United States in North America, south into Central America. At home almost anywhere, it is able to live in practically every terrestrial landscape from the frozen arctic tundra and dense boreal forests of the far north down through the mountains and valleys of the continents, and into the hottest of deserts of the subtropics. It was once more common across the Great Plains of North America, where it followed grizzly bears, wolves and other predators which provided an abundance of carrion. Being highly adaptable, today it is reinvading parts of its former, more easterly range and expanding into urban areas, as it now associates with humans, feasting on garbage and scavenging road-kill, the present-day analog of remains left by top carnivores it followed in the past. Although ravens tend to fancy dining on carrion, they have a sound generalized design and are able to survive on a diverse diet including insects, scorpions, frogs, lizards, young birds and eggs, fruits, buds, seeds and grains. Unfortunately this also includes feeding on the young of endangered Mojave Desert tortoises whose shells don't harden until they have reached seven years of age.

The Common Raven is the most highly visible bird in the Great Basin. About the 1860s, Ridgeway wrote, "This large bird is one of the most characteristic species of the Great Basin, over which it appears to be universally distributed, no desert-tract being so extensive or sterile that a solitary raven may not be seen any day, winging its way silently, or with an occasional hoarse croak, from the mountains on one side of the desert to the range opposite." A majestic and imposing bird, the raven is the largest member, of not only of the corvids, but of the passerines as well. It stands two feet tall, and bears wings that span nearly four feet. Its satiny black plumage glistens in the sun with iridescent greens, blues and purples. The raven can readily be discerned from its cousin the crow by its larger size (a raven commonly weighs about three times as much as a crow), by its pointed as opposed to blunt and splayed wings and by its especially long, wedge-shaped tail which contrasts with the relatively square tail of the crow. The raven also bears a larger and heavier bill, sports shaggy throat feathers, known as "hackles," croaks in a noticeably deeper, more resonating tone, and in flight, speeds along with distinctly liquid gliding strokes. One other raven, the Chihuahuan Raven, *C. crytoleucus* also inhabits North America. A smaller raven, residing in Mexico and a few southwestern states, it has a slightly different voice and the bases of its neck feathers are white, a feature visible only when the bird is preening or its feathers are blown in the wind.

Although ravens are relatively common, most people are familiar only, as far as calls go, with the raven's trademark croaking *rrock, rrock, rrock* call. This is but only one call in the raven's elaborate and replete linguistic repertoire. Ravens in fact, are believed to produce a greater variety of sounds than any other animal except human beings. Depending on who is counting, the raven is estimated to make between 18 and 64 recognizably different croaks, gurgles, guttural mutterings, tonks, clicks, rattles, and trills. Some have attempted to describe and decipher the meanings of these various sounds. Innate and supposedly stereotyped calls have turned out to be confusingly variable, and adding in local dialects plus the raven's ability to mimic sounds, has made the task incredibly difficult. It seems ravens speak a language of their own.

No one really knows for sure what ravens are saying with all of their calls, but some association with specific behaviors and patterns have been discerned. In a series of elegant experiments, researcher Bernd Heinrich was able to show that young ravens recruit one another's help by giving excited "yells" when they locate a bonanza of food. The young ravens supposedly also share information about rich food supplies at their nighttime roost sites. Apparently actively recruiting other youngsters allows them to gang up on pairs of dominant adults and drive them off carcasses, something a lone juvenile raven would not be able to do. Heinrich also inferred that young ravens may advertise food sources they have found not only to gain or maintain access to that food, but possibly to increase their status and demonstrate their fitness to potential future lifelong mates.

Young ravens don't spend all of their time squabbling over food, but often engage in a variety of playful games. Corvids in general are recognized as the most playful of birds and young ravens are said to be the most playful of corvids. Heinrich suggests the spectacular airborne play of ravens—breathtaking acrobatic combinations of dives, rolls and loops—is not only fun, but may be another way juvenile ravens show off. "I wonder whether the social play of ravens isn't similar to a dance where teenagers get to know each other. Doing the raven "rrock" and roll may be another version of doing the twist and shout." As ecologists continue to learn about the raven and its intriguing behaviors, it definitely becomes more clear how uncommonly unique the common raven truly is.



American Crow

American Crow - *Corvus brachyrhyncos*

It has been said that if a person knows only three birds in all the world, one of these will be a crow. In common usage, the word "crow" is often applied to all the shiny black and relatively similar members of the genus *Corvus*, representatives of which can be found across most of the globe. The name "crow" comes from the Anglo-Saxon word, *crawe*, an imitation of the call of a crow. In the United States, ornithologists divide these shiny black birds into four species: the Northwestern Crow, *C. caurinus* which inhabits a narrow region and small islands along the Pacific Coast from Alaska to Washington State; the Fish Crow *C. ossifragus*, a crow living in tidewater areas and river valleys along the Atlantic Coast from New England to eastern Texas; the Tamaulipas Crow, *C. imparatus*, a recent immigrant from Mexico in the late 1960s to the Brownsville area of Texas; and the American Crow, *C. brachyrhyncos* (called the common crow prior to 1982), the largest, most widespread and most familiar of the lot.

The breeding range of the American Crow extends coast to coast in North America over much of Canada and the United States, down into northern Mexico. Prior to settlement and the spread of agriculture and ranching, crows were not especially common across the plains and deserts of the continent. They were extremely rare in the Great Basin. Populations have grown and increased their range over time, but in Utah, crows are considered abundant only when northern populations migrate south to escape wintery conditions. Crows nest in only a few locations in the state.

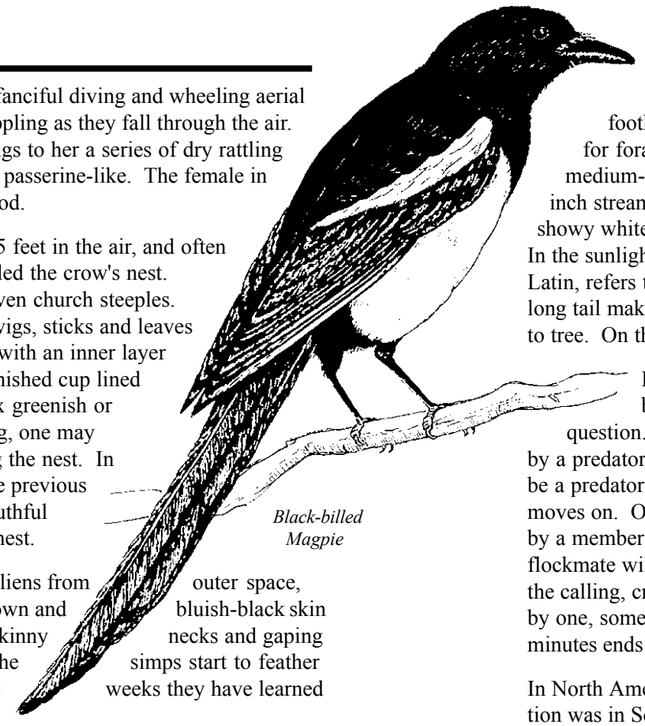
Indeed, before 1965, the crow was listed as a rare summer visitor. Ornithologists first noted several breeding crows in Rich County in the early 1960s. Then, in 1965 a nest was found in Cache County along the Logan River. No new reports of crows nesting in other areas were made until the 1980s when active nests were spotted in Morgan and Weber counties. Most of the nests were located in rural farm areas along river courses where tall cottonwoods provided good nest sites. It wasn't until June 1997, that a crow's nest was discovered in a city—a pair was nesting in the Odgen cemetery.

With crows frequenting Utah in greater numbers, it may be important for people to know how to distinguish a crow from the more common raven. Although both are a shiny iridescent jet black in color, the crow is smaller (about 17-21 inches long with a 3-foot wingspan) and has a shorter, thinner beak. The shorter beak of the crow—although still relatively large at 2-2 ½ inches long—is reflected in the generic portion of its scientific name, *brachyrhynchos* which in Greek, means short-beaked. The call of the crow is a shrill nasal *caw* in contrast to the deep *croak* of the raven. When not breeding, crows are also considered to be more gregarious, sometimes flocking in groups of hundreds of birds, although ravens also can be seen together in groups of 20 to 50 birds.

Flocks of crows range widely for food, which includes grasshoppers, caterpillars, grubs, worms, most insects, grain, fruit, the eggs and young of other birds, carrion and garbage—or basically just about anything edible they can find. Crows have especially keen senses of sight and hearing, and are very wary. When flocks of crows are foraging, often one or two sentries will watch for danger, ready to alert the flock with a sharp alarm *caw*. If the danger happens to be in the form of an owl or hawk, the crows will most likely mob it. Calling excitedly to attract other crows, they swoop low and dive-bomb the predator, harassing it until it flies off. In turn, crows are mobbed by smaller birds like kingbirds and redwing blackbirds.

Crows begin to court in early spring. To impress potential mates, males perform fanciful diving and wheeling aerial displays, like spirits dancing with the sky. Rivals sometimes chase and fight, grappling as they fall through the air. When pairs form, the male bows deeply near his mate, spreads his wings, and sings to her a series of dry rattling tones and soft *coo-coo*s. The "love song" is surprisingly gentle and unexpectedly passerine-like. The female in reply utters tender chirping gurgley sounds similar to a young bird begging for food.

Crows like to place their nests high in the crotch of a tree at least 25, and up to 75 feet in the air, and often near the very top of the tree. Hence the lookout shelter at the top of a ship is called the crow's nest. They prefer trees but have learned to use cliffs, rock crevices, utility poles and even church steeples. Often well hidden, if a nest is seen, from below, it looks like an untidy mass of twigs, sticks and leaves about two feet across and eight or nine inches high. This base is bound together with an inner layer of roots, mud and frayed bark to form a deep bowl. Inside the bowl is a finely finished cup lined with soft wool, grass, feathers, moss, or even yarn or such. Normally four to six greenish or blue-greenish eggs covered with brown or olive markings are laid. During nesting, one may sometimes see not just the nesting pair, but one or two additional crows attending the nest. In several species of corvids including the American Crow, sibling juveniles from the previous one or two years will often serve as "helpers" at the nest. Some believe these youthful assistants are actually apprentices, practicing skills they will use when they later nest.



Black-billed Magpie

Hatchling crows, called simps, are not what one would consider cute. More like aliens from outer space, they have been described as the ugliest of babies, naked little chicks with livid brown and bluish-black skin half hidden by black pinfeathers, enormous stomachs, huge wobbly heads on skinny necks and gaping bright red, velvet mouths constantly open for food. Within three weeks or so, the simps start to feather out as they begin the transformation from hatchling to fledgling. By six to eight weeks they have learned to fly, albeit less than gracefully.

Even after they leave the nest, the crow family stays together for a while. The young birds, which happen to have blue eyes instead of brown eyes, continue to be fed by their parents until they have learned to hunt for themselves. Towards the end of fall, family groups become more social again and join other groups of crows. At the end of each day, large numbers of crows assemble at roosting sites to sleep through the night. Some roost sites have been used by crows for centuries. Some are massive, occupied by hundreds of thousands of crows at a time. These nighttime roosts, in the past, were often dynamited in massive and gruesome crow extermination attempts.

Many a crow has unjustly met its demise in such a fashion because of the reputation they have earned as destroyers of crops. At least one farmer learned otherwise. After shooting crows in his field early one morning, he examined the contents of their stomachs. To his surprise they were full of black beetles and cutworms. Cutworms come out of the soil at night, chomp on sprouting crops and burrow into the ground by day. It turns out the early feeding crows were gorging on the cutworms before they had submerged for the day. Still maligned today, our language reflects negative feelings towards crows. To "crow" is to brag obnoxiously, wrinkles around ones eyes are called "crows feet" and to "eat crow" means to have to accept something one has fought against. In contrast, "as the crow flies," (moving in a straight line) is probably a saying that reflects something good about crows.

Black-billed Magpie - *Pica hudsonia*

There's no mistaking a magpie. If you've been almost anywhere in North America, west of the prairies, north of the dry deserts and east of the Sierra Nevada range, and you saw a striking black and white patterned bird with an especially flashy long tail gliding from tree to tree, it's a sure bet you saw a Black-billed Magpie. The only other bird with which it could possibly be confused is its very similar, but trimmer, and shorter-tailed cousin, the Yellow-billed Magpie, *Pica nutalli*, which, in contrast, has a bright yellow bill and ranges solely in the valleys of central California.

The Black-billed Magpie is a wide ranging species across western North America. Similar Black-billed Magpies also range widely across most of Europe and Asia. Up until recently, the Black-billed Magpies of North America and those of Eurasia were considered conspecific (the same species) with the about 12 different subspecies recognized. Some scientists however, believed the North American subspecies was distinct enough in a variety of aspects to actually be a separate species from its Eurasian counterparts. Within the last two years, the North American subspecies was split off as a separate species of its own.

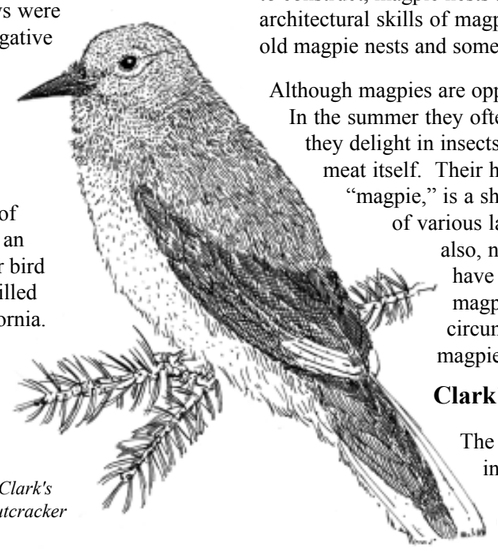
In Utah, Black-billed Magpies are common and widespread permanent residents in the valleys and foothills where they live along streams with brushy thickets and scattered trees interspersed with open areas for foraging such as meadows, grasslands, sagebrush, croplands and pastures. Black-billed magpies are medium-sized corvids measuring about 12 to 22 inches in length, including their longer-than-their-body, 9 to 12 inch streaming tails. They are largely black with sharply contrasting white breast feathers, white scapulars, and showy white outer primaries outlined in black on each of their wings that flare elegantly as the wings move in flight. In the sunlight, their black feathers gleam a shiny green and blue. The word "pica" of the magpie's scientific name, in Latin, refers to its black and white coloration. The wings of the magpie are short and rounded. This, along with its long tail makes it difficult for magpies to fly rapidly or far. Instead they tend to swoop deftly and gracefully from tree to tree. On the ground, they walk with a jerky, staggering gait with their tail slightly raised. If in a hurry, they hop.

If you've ever seen a magpie, no doubt you've heard it too. The most commonly heard call of the Black-billed Magpie is a loud, harsh and high-pitched *shack, shack, shack* call often uttered as if asking a question. Another call is a more rapid and excited *ca-ca-ca-ca-ca* made when a magpie is agitated or threatened by a predator. This raucous alarm call attracts other magpies within the flock. If the source of agitation turns out to be a predator such as a coyote, owl, hawk or domestic cat, the magpies will incessantly mob the predator until it moves on. On occasion, a predator will succeed in capturing and killing a magpie. If a dead magpie is encountered by a member of its flock an unusual magpie "ceremony" may ensue. First, the magpie that discovers its dead flockmate will call loudly to beckon other magpies within earshot. Those that arrive perch in nearby trees and add to the calling, creating a real commotion, and within minutes, a large group of magpies will have assembled. Then one by one, some fly down, walk around the deceased and chatter. This funeral-like gathering which lasts about 10 to 15 minutes ends as all the participants silently depart.

In North America, the Black-billed Magpie first became known to science in 1804 when the Lewis and Clark expedition was in South Dakota. Becoming well acquainted with the bird, they noted how it boldly invaded their tents to steal meat and take food from their hands. The Native Americans had met the magpie long before. The Paiutes called it the Que'-tou-gih, gih and to the Washo it was known as Tuh'-tut.

Even if unseen or unheard, the presence of the Black-billed Magpie can't be missed, marked by their countless huge domed stick nests scattered in thickets and groves of trees, especially along streams. Magpie nests are generally located within 25 feet of the ground. A major engineering feat, nests are large, two- to four-foot high untidy, structures composed of sticks cemented together with mud and sometimes, cow dung, and lined with rootlets, plant stems, grasses and hair. The domed portion atop the base of the nest is usually woven with thorny branches, forming a veritable defense for predators to breach. One or two openings in the sides let the magpies fly in and out of their fortress. Often several nests in various states of repair or disrepair are clustered in a small area. Taking 40 to 50 days to construct, magpie nests are literally and figuratively built for life; many other animals are able to profit from the architectural skills of magpies. Owls, kestrels, tree-nesting ducks and various other birds are known to make use of old magpie nests and sometimes nests are appropriated by small mammals like squirrels as refuge during a storm.

Although magpies are opportunistic omnivores and eat a variety of foods, they seem to be especially fond of insects. In the summer they often enjoy grasshoppers and other ground-dwelling arthropods. Much of the rest of the time, they delight in insects associated with carrion such as flies and their larvae, eating the maggots rather than the meat itself. Their habit of favoring maggots is said by some to be the source of their common name, where "magpie," is a short version of "maggot-picker." Magpies are also known to pick and eat ticks off the backs of various large ungulates, and to sometimes pick at sores and cuts on the backs of livestock. They also, now and then, take the eggs and young of small songbirds. Such unendearing behaviors have not benefitted the magpie. During past campaigns across the Midwest to eliminate coyotes, magpies often short-circuited poisoning of coyotes by eating the poisoned bait beforehand. To circumvent the problem, trappers unremorsefully spread poisoned grain first to eliminate the magpies. Like their nests though, magpies have managed to endure and are here to stay.



Clark's Nutcracker

Clark's Nutcracker - *Nucifraga columbiana*

The Clark's Nutcracker is nutty about the seeds of conifers. Fortunately for it, it is a year-round inhabitant of the high montane forests of the western United States and Canada where conifers abound. Many snow skiers and others who engage in wintertime outdoor activities in the

Continued on page 8

Resources

Give us a Caw or Croak For These!

Call Project WILD at (801) 538-4719

Corvid and Other Resources:

Raven; Crow - Copies of activity pages focusing on these two corvid species from the excellent activity book, The Kids' Wildlife Book by Warner Shedd, Williamson Publishing, 1994.

Crow and Raven Folklore - Short overview of crow and raven folklore taken from the excellent book, The Folklore of Birds by Laura C. Martin, The Globe Pequot Press, 1993.

Corvid Species Overviews - Set of corvid species information sheets taken from the newly developed Utah Conservation Data Center, a website providing information and photos of all of Utah's plant and animal species. The web address is: **http://www.utahcdc.usu.edu**.

Shade the Coffee, Shelter the Birds - Beautiful International Migratory Bird Day 2001 poster focusing on relationship between migratory songbirds, their wintering habitat and the production of coffee.

The Dry Life: Mohave Desert Ecosystem - Excellent article, activities and colorful, educational poster written and developed by the Bureau of Land Management.

What's Wrong with This Picture - Great poster with information and educational activities on the growing problem of invasive weeds. Produced by the Bureau of Land Management.

Oceans - Coastal Hazards: - Colorful full-size cartoon poster featuring hazards to coastlines such as Hurricanes, Tsunamis and Coastal Erosion. Part of the U.S. Geological Survey's Water Education poster series. Request Grade or Middle school version.

National Wildlife Refuge Week 2000 - Wonderful poster featuring wildlife of the Artic National Wildlife Refuge.

Stormy Weather Soundtrack - Audio tape with sounds/music to accompany the two guided imagery readings of the Project WILD activity, Stormy Weather.

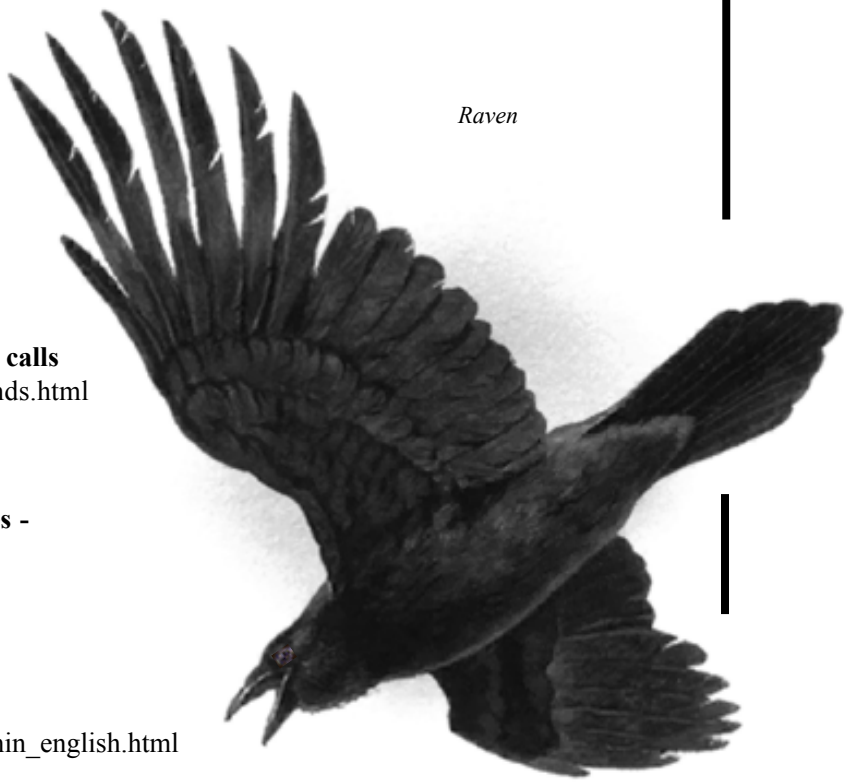
Corvid Internet Sites:

Two great corvid photo galleries with downloadable images
http://taiga.com/~jason/pixbrowse.phtml?targ=/animals/corvids/
and
http://www.shades-of-night.com/aviary/images/gallery.html

Fun sites where one can hear a variety of corvid calls
http://www.shades-of-night.com/aviary/sounds/sounds.html
and
http://www.naturesongs.com/birds.html#corvi

Excellent bibliography of corvid related resources - includes childrens' books too
http://www.azstarnet.com/~serres/biblio.html

Edgar Allen Poe's Poem, *The Raven*
http://members.tripod.com/~raven_song/poem.html
and some **Raven Folklore**
http://w1.859.telia.com/~u85903393/hugin_och_munin_english.html



Raven

Clark's Nutcracker: A Brainy Bird! *Memory, Measurement, Math & More*

Objectives: Students will learn about the amazing memory capacity of the Clark's Nutcracker and gain an understanding of the process by which these birds remember the specific locations of the numerous food caches they make each year.

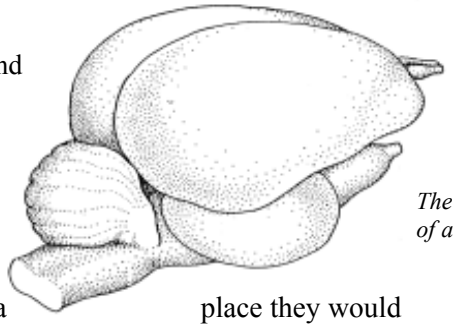
Method: Students simulate a Clark's Nutcracker choosing places to cache food and attempting to relocate stores of food at a later time. They then compare their memory powers to that of these birds.

Background: Many corvids periodically cache food for use at later times. The Clark's Nutcracker, however, is a food caching champion. The Clark's Nutcracker feeds primarily on the seeds of pines. Since they live in forests at relatively high elevations, they need to spend much of the summer, when pine seeds are available, caching seeds for use in the winter, when food is not readily available. Over the course of a summer, it is estimated that a single nutcracker stores between 22,000 and 33,000 pine seeds within up to 2,500 different places.

In order to survive the winter, the nutcracker needs to recover at least a third of its cached reserves, some of which were hidden a year ago! How can it remember the many locations where it cached its provisions? Surprisingly, nutcrackers find their caches of seeds with relative ease, even when the ground is covered with snow. Their success rate of finding their caches of seeds turns out to be about 70 percent. Because of their high percentage of success, scientists conclude that memory of some sort is involved.

While testing this theory, one researcher noticed that the nutcrackers often deposited seeds within a hand's width of a conspicuous object such as a rock. When he shifted some of the objects, the nutcrackers shifted the locations of where they searched and probed for their caches by a comparable distance. Apparently, nutcrackers are able to plot the positions of their caches in relation to visual landmarks within their habitat. How they are able to remember the placement of such a great number caches though is still unanswered. They must truly be the one of the most brainy birds in the avian world.

Materials: For each 2 to 3 students: 1 measuring tape; 1 golf tee; pencil and paper; rope or chalk to mark boundaries.



The brain of a bird

Procedure:

1) Take students outside to a large grassy field or paved area about 50 feet by 100 feet in size. Delineate the sidelines with rope or chalk.

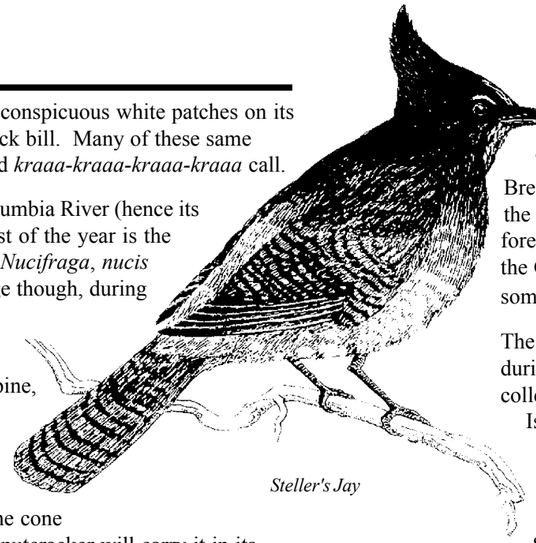
2) Next, working in groups of 2 or 3, have groups randomly choose a place they would store food within the area and mark their position with the golf tee. Have them then measure its distance in feet from two sides of the area. They should get a pair of numbers like coordinates on a grid. Have them record the coordinates for that point. Have them repeat this process for a total of ten coordinate positions, measuring from the same two sides each time. When done, leave the sidelines delineated. (Instead of marking boundaries and using measuring tapes, position can be measured with a Global Positioning System (GPS) receiver if one is available.)

3) In a few days, have students return to the area. Without looking at the data, have them attempt to relocate each of the ten positions one at a time. When relocating each point, have them mark it with the tee and measure as before. Have them record the coordinates obtained. When done, return to class.

4) Inside, have students examine and compare their two sets of data. How many of the ten positions were relocated correctly? Have them calculate their percentage of success (number positions correctly relocated ÷ total number positions X 100). Were they as successful as the nutcrackers are? What methods did they use to relocate their positions? Discuss with students the method nutcrackers are thought to use to relocate their food caches. Did they use a similar method or another method? Perhaps have students try again later, to see if they do better using the nutcracker's food cache position relocation technique.

mountains recognize the Clark's Nutcracker as the jay-sized, dapper gray bird with conspicuous white patches on its black wings, white feathers flanking the edges of its black tail and a sturdy, long black bill. Many of these same people have also experienced this bird's notorious begging for handouts with its loud *kraaa-kraaa-kraaa-kraaa* call.

Named after Captain William Clark who discovered it in 1805 in Idaho along the Columbia River (hence its species name, *columbiana*), the Clarks's Nutcracker's dietary staple throughout most of the year is the seeds of pine cones which they crack open with their bills (hence its generic name, *Nucifraga*, *nucis* being Latin for "nut" and *frangere* meaning "to break"). True to their corvid heritage though, during the summer they supplement their diet with insects and other small prey.



Steller's Jay

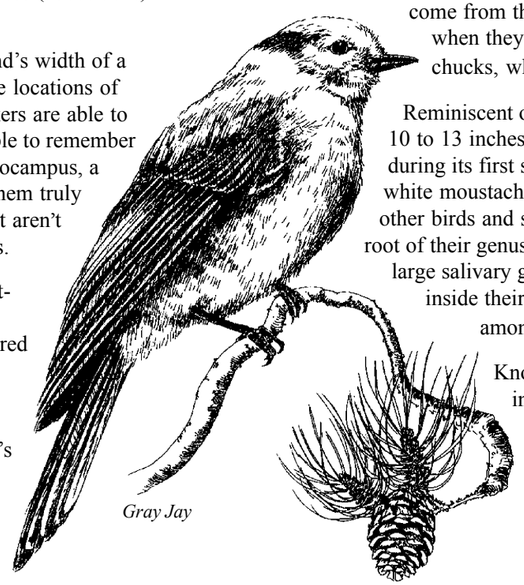
Nutcrackers harvest these fat- and protein-rich seeds from a variety of conifers including such favorites as pinyon pine, whitebark pine, ponderosa pine and limber pine, depending on what is locally available. In their search for cones with seeds, they make use of the entire elevational range of a mountain from lower elevation pinyon woodlands all the way up to beyond tree line and into the alpine zone of higher peaks. When extracting seeds from a large cone, a nutcracker will stand atop the cone or hang beneath it. With a smaller cone, the nutcracker will twist or peck at the cone to detach it from the tree before the seeds are removed. After freeing the cone, the nutcracker will carry it in its bill to a seed extracting perch on a horizontal limb. Then, using one foot to hold the cone, the nutcracker uses its bill like a crowbar to pry apart the scales of the cone, exposing the seeds.

If the nutcracker intends to eat a harvested seed right then, the seed coat is cracked open between its mandibles or held down with its foot and hammered open with its bill. If it chooses to store the seed for later, the nutcracker stuffs the seed into its sublingual pouch (below the tongue) in the floor of its mouth. This sublingual pouch, which is a structure unique to nutcrackers, has the capacity to hold about sixty to ninety pine seeds depending on the size of the seeds (which depends on the species of pine). After filling its pouch, the nutcracker flies off to stash away its future supply. Nutcrackers cache their seeds in communal caching areas, often miles away, along exposed steep, south-facing slopes or ridges where the sun and wind prevent a lot of snow from accumulating during the winter.

To cache its quarry, the nutcracker digs a small trench about one inch deep into the ground with its bill, deposits a few seeds in the trench and then covers the seeds with soil or litter, again with its bill. Several caches are usually clustered together in one area, spaced up to roughly 25 inches apart, until the pouch is empty. Over the course of a summer, its is estimated that a single nutcracker stores between 22,000 and 33,000 pine seeds within up to 2,500 different places. In order to survive the winter and spring, the nutcracker needs to recover at least a third of its cached reserves, some of which were hidden a year ago! How can it remember the many locations where it cached its provisions? It turns out that nutcrackers have mastered the game of hide and seek. Surprisingly, they find their caches of seeds with relative ease, even when the ground is covered with snow. Because of their high percentage of success (about 70%) in finding their stores of food, scientists conclude that memory of some sort is involved.

While testing this out, one researcher noticed that the nutcrackers often deposited seeds within a hand's width of a conspicuous object such as a rock. When he shifted some of the objects, the nutcrackers shifted the locations of where they searched and probed for their caches by a comparable distance. It appears that nutcrackers are able to plot the positions of their caches in relation to visual landmarks within their habitat. How they are able to remember the placement of such a great number caches though is still unanswered. Having an extra large hippocampus, a part of the brain associated with spacial memory, ensures nutcrackers almost never forget, making them truly the spatial memory geniuses of the avian world. If every cache isn't found, that's ok too. Seeds that aren't recovered can sprout into new pines, benefitting both the trees and future generations of nutcrackers.

Caching and retrieving stores of seeds, for not only themselves but to feed to their young, allows nutcrackers to begin breeding as early as January or February when the mountains are still deep under snow. Nests are built in conifers, often even in conifers on cold steep slopes, but only in sites sheltered from the fierce winds of winter. A well insulated nest serves also to combat the cold. And both parents are able to incubate the brood; just as needed, in nutcrackers, males too possess a well-developed brood patch which makes the male able to incubate the eggs while the female retrieves seeds from her caches located where only she can remember. Maybe you'll think of the nutcracker's remarkable memory the next time you're done skiing and searching the parking lot for your car.



Gray Jay

Steller's Jay - *Cyanocitta stelleri*

The most conspicuous of the jays, the metallic, dark-blue crested Steller's Jay is a true denizen of the West. Breeding from Alaska, western Canada and the United States south through western Mexico to Nicaragua, this jay has the most extensive range of any North American jay. Within its range, this handsome jay generally inhabits coniferous forests and sometimes mixed pine-oak woodlands. In Utah it is common in montane forests along the eastern edge of the Great Basin. Once thought to be absent across the deserty interior of the Great Basin, it is now known to live in some of the more forested ranges such as the Deep Creek and Snake ranges along the Utah-Nevada border.

The Steller's jay is named after German naturalist Georg Wilhelm Steller, its discoverer, who accompanied Vitus Bering during a 1740-1742 expedition along the coast of Alaska. The impressive jay was one of the specimens frantically collected on the only day Steller was able to explore before heading back to Siberia and becoming marooned on Bering Island.

Its dusky blue to black head topped with a prominent crest and deep, azure-blue wings and tail make the Steller's Jay easy to recognize. This jay, and its eastern counterpart, the familiar Blue Jay (C*yanocitta cristata*) are the only crested jays in North America, and the only New World jays with barred wing and tail feathers. Within the Steller's Jay, there is a good deal of variation in plumage, color, size and crest length along the extent of its range. The race common to the Central and Southern Rockies, *C.s. macrolopha*, has a longer crest, paler back, white streaks on its forehead and a white mark over each eye. (Two other blue-feathered but non-crested jays found in Utah are the all blue-feathered, highly gregarious Pinyon Jay, *Gymnorhinus cyanocephalus,* found in pinyon-juniper woodlands across the West, and the elusive, blue-backed, white-throated and pale-breasted Western Scrub Jay, *Aphelocoma californica,* common to shrub-dominated habitats such as scrub oak stands and pinyon-juniper woodlands.)

Habituating readily to people, Steller's Jays often teem at feeders, picnic areas and campgrounds where they proclaim their presence with loud *waah, waah* or noisy *shook, shook, shook* alarm calls. Having quite a mixed bag of voices, they are also noted for their ability to utter a very perfect imitation of the squealing note of a red-tailed hawk, presumably a ploy to scare away predators. Although somewhat obnoxious in their quest for handouts, many enjoy observing the antics of this striking crested jay.

Gray Jay - *Perisoreus canadensis*

The Gray Jay is another jay which has learned that people can mean food. Daring birds, they will eat right out of your hand, nab food from your plate the instant you turn your back, and even try to pry open containers to get to the goodies inside. Also well-known to rob traps and bait without getting caught and eating the carcasses of those that do, these fearless jays have garnered themselves an array of nicknames including "camp robber," "venison hawk," "grease bird," and "meat bird," all alluding to their habits and taste for meat. Its best known alias, "whiskey-Jack" is said to come from the mispronunciation of an Indian name, "wis-ka-tjon" turned into "whiskey-John." Sometimes when they visit campsites or a hunter in the woods, they'll perch above and sing a surprisingly soft medley of chucks, whistles, warbles and squalls.

Reminiscent of an oversized chickadee, the gray jay is a large, fluffy, small-billed and long-tailed gray bird about 10 to 13 inches long with a white head and crown accented with a partial black cap towards the back. Oddly, during its first summer, a juvenile bears no resemblance to its parents, being almost sooty black with only a tiny white moustache. Omnivores, Gray Jays feed on a variety of insects, seeds, fungi, berries, eggs and young of other birds and small rodents. Living where winters are harsh, they save much of their food for snowy days (the root of their genus name *perisoreyein* means "to heap up" in Greek). Interestingly, they happen to have an unusually large salivary gland that produces especially sticky saliva. When a mouthful of food is to be stored they roll it inside their mouth to coat it with the saliva. These sticky balls of food are then stashed on ledges, twigs or among the needles of evergreens where they stay well preserved.

Known formerly as the Canada Jay, the range of the gray jay is predominantly Canadian, corresponding with the boreal and sub-alpine coniferous forests of this northern land. In Utah, the subspecies *P.c. capitalis* inhabits similar high elevation fir and spruce forests found in the mountains of southern, central and eastern Utah, especially in the Uinta Mountains. If ever you venture into these high mountain forests, perhaps you'll be kept company by a bold and friendly Gray Jay.

History

Humankind and Corvid-Kind

Long evoking intense emotion in the minds of people, ravens and crows have played important roles in both Old and New World cultures, mythologies and writings throughout time. Even today superstitions about these mysterious and intelligent birds still abound.

In many early European societies, ravens were connected with special powers. They were believed to be omniscient, knowing all things, past, present and to come. According to Nordic legend, Odin, the Lord of the Norse and Teutonic gods, kept a pair of ravens named Hugin (Thought) and Munin (Memory) perched on his shoulders. Each dawn he sent them out to survey the ends of the earth and upon their return, to share with him the secrets they learned. In ancient Ireland, future events were foretold from the calls of ravens, and still today, the Irish phrase, "raven's knowledge," means to see and know all. In Baltic countries ravens and crows were associated with wisdom and medicine, and a great Hungarian king bore the raven as part of his family coat of arms. In Viking lore, the raven was the bird of battle, and warriors, as did William the Conqueror, carried with them a sacred raven.

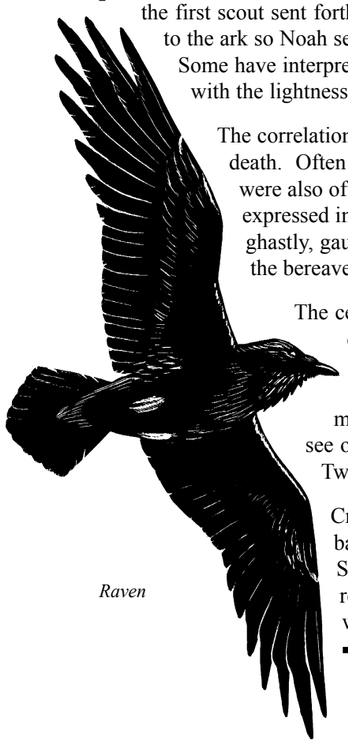
But not all held ravens and crows with such high regard. Many feared the big black birds and associated them with death and carnage. Their nature of opportunistically scavenging on rotting flesh made the connection with death and evil apparent. We usually speak of other animals more favorably, but for these corvids, we refer to groups of them as an unkindness of ravens and a murder of crows. Old English literature often placed ravens at the scene of battle, as in the heroic poem of *Judith,* in which the raven is referred to as the "slaughter-greedy bird. . ." who "sang a battle song," and in the poem, *The Battle of Brunanburh*, wherein the victors "left behind them, to enjoy feasting on the corpses, the dark-coated one, the swart raven with the horny beak. . ." The word "ravenous," meaning insatiably hungry or greedy, comes from this.

True to tradition, William Shakespeare followed suit, treating the raven as a symbol of evil and destruction. In *Macbeth*, the raven "croaks the evil entrance" and in *Othello*, the raven flies "o'er the infected house." Still today in Germany, an evil person who ought to be hanged is called a "rabenaas" (raven carrion). Held over in our language, the word "ravenstone" is an old English term for a place of execution. And in medieval times, grim cages in which prisoners were hung to die were called "crow's cages." In the story about Noah and the flood in Genesis, the raven is the first scout sent forth from the ark to see if the waters had started to recede. The raven never bothers to return to the ark so Noah sends out the more reliable dove instead. The dove returned with a freshly plucked olive leaf. Some have interpreted this as an example of the duality of good and bad - the darkness of the raven in contrast with the lightness of the dove.

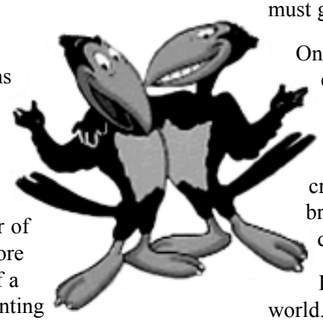
The correlation between ravens and evil and death lead to the assumption that ravens could predict death. Often their sonorous croaking was thought to be a prophesy of tragedy and doom. Ravens were also often perceived as intermediaries between the living and the dead. This idea is clearly expressed in Edgar Allen Poe's famous poem, "The Raven," in which the "grim, ungainly, ghastly, gaunt, and ominous bird of yore" repeatedly utters the word "Nevermore," tormenting the bereaved soul mourning his departed lover, Lenore.

The centuries old practice of "crow augury," predicting the future by counting the number of crows present at significant times, stems from such beliefs. Recently brought to more peoples' attention by the popular band, *Counting Crows*, crow augury makes use of a rhyme (of which there are now many versions and may actually have began as counting magpies) in which the number of crows counted determines the future. For example, if you see one crow it foretells an unhappy event; two crows means a change for the better; and so on. Twelve crows is considered best, predicting fulfillment and riches or the end to a problem.

Crows and ravens were held in disrepute not only because of their connection with death and bad luck, but also because of their exaggerated tendency to relish newly sprouted corn. Scarecrows, intended to ward off such crop raids, seldom served as more than a handy resting perch, as shown by the mischievous cartoon character crows, Heckle and Jeckle, who made a mockery of people who tried to foil them. As convenient scapegoats for crop failures, crows and ravens were relentlessly persecuted as vermin. Ravens feeding on the carcasses of sheep and new-born lambs that had died were also often unjustly blamed for the deaths. Over large areas of Europe, millions of crows and ravens were eradicated by poisoning bait, shooting and destroying nests.



Raven



At the Tower of London in England, ravens are kept as part of a prophecy. As told in a letter written by the current Raven Keeper at the Tower, during the time of Charles II, ravens in England were once more abundant. After the Great Fire of London in 1666 ravens became a nuisance as they gorged themselves on bodies left from the fire and their numbers grew. Residents petitioned the King to get rid of all of them. A soothsayer, however advised the King that if he removed all the ravens from the Tower, a great disaster would befall England and his Royal Palace would crumble into dust. Not wanting to tempt fate, the King decided to keep six ravens and appoint a keeper. Since then, a minimum of six ravens have been maintained in residence at the Tower of London. Although the King's decree to keep ravens has been upheld, there are no more free wild ravens in or around London.

European immigrants to the New World brought with them their fear and loathing of ravens and crows. Throughout the East and Mid-west, exterminating crows was viewed as doing good. With settlement of the West ravens became victims of poisoned bait set for wolves. In his book, *Hunting and Trading on the Great Plains: 1859-1875*, James R. Mead writes on the fatal association of ravens, wolves and their prey, the buffalo. "The buffalo were killed by the bullets of the hunters, the wolves were killed with strychnine (laced in the buffalo carcasses) for their furs, and the ravens died from eating the poisoned carcasses of both, so that they all became practically extinct at about the same time."

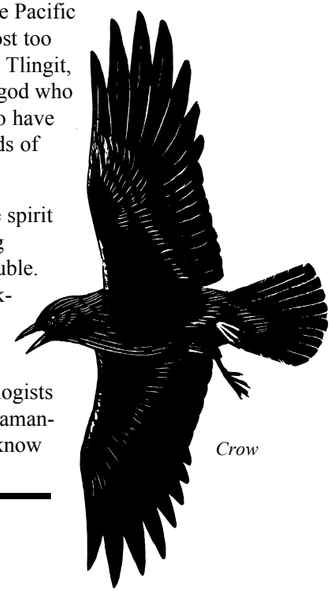
Negative attitudes towards crows and ravens persisted well into the 20th century and still exist today. Ravens, and especially crows, known to take eggs of waterfowl, were unjustly blamed for declines in populations of ducks. For example, in 1932, the magazine *Field and Stream* issued a form letter which stated, "If you have been following the reports from Canada you know that practically everyone competent to judge is convinced that the greatest destroyer of North American wildfowl is the crow." Soon after, article after article vilifying the crow as the evil scoundrel responsible for game shortages appeared in various sporting magazines. In the 1940s large roosts were often bombed killing thousands of crows, in the 1960s Bert Popowski's *Varmint and Crow Hunter's Bible* was very popular and in an 1985 article in *Fur-Fish-Game* magazine, the author concludes that crow hunting is a "sure cure for cabin fever."

In 1972, the Migratory Bird Treaty Act was amended too include ravens and crows, but most states still list crows as a legal "game" bird. They are treated differently than other game birds though in that there is usually no bag limit and they can be shot not only in the fall but also in the spring during all but the peak of the breeding season. Ironically it is illegal to tamper with the nest of a crow or raven, and researchers who wish to take these birds for scientific studies must get state and federal permits. Having a pet crow or raven is also strictly against the law.

On the opposite end of the spectrum ravens and crows have been held in the highest regard and considered profoundly sacred by almost all native people of the Americas, especially those of the Pacific Northwest, including Alaska. Raven myths and stories from the area are legion and almost too numerous to recount. Within various tribes of the region—Tsimishian, Haida, Bella Bella, Tlingit, Kwaikiutl and Koyukons—"Raven" is recognized as a special totem spirit. Raven is the god who created the earth, the moon, the sun, the stars and people themselves. Raven is also said to have brought fire to people so the would not freeze in the darkness, supplied water during periods of drought, and made salmon for people to eat.

In many of the legends, Raven is considered to be a messenger between the living and the spirit world. Although never evil, Raven is also often a rascal. Nearly all tribes have stories featuring Raven's mischievous deeds and exploitation of others which inevitably get the trickster into trouble. Koyukon tribal shamans still regularly invoke Raven's power to scare away sickness by mimicking his cawing, spreading their arms like wings and hopping on both feet. "Crow" and "Magpie" too are spiritually significant totems with distinct and honored qualities.

According to one Tlingit story, Raven came from where the East Wind blows. Some anthropologists think Asiatic people following game from Siberia across Beringia brought Raven religion and shamanism with them when they spread into North America. Those who see Raven as god however know Raven did not "come" from anywhere, but always was and will be. To them, Raven is eternal.



Crow

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